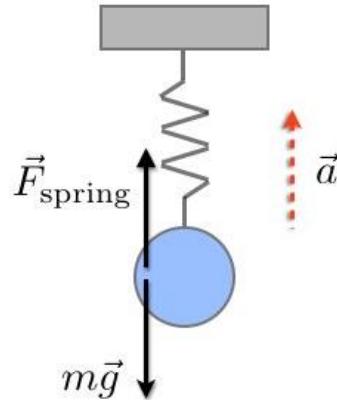


Answer on Question #57022, Physics / Mechanics | Relativity

A very light ideal spring having a spring constant of 8.2 N/cm is used to lift a 2.2 kg tool with an upward acceleration of 3.25 m/s². If the spring has negligible length when it is not stretched, how long is it while it is pulling the tool upward?

Solution:



Sum of the vertical forces (up is positive) = mass * acceleration

What are the vertical forces? Weight, which acts down (negative) and the force, which acts up (positive).

$$\begin{aligned}ma &= F_{\text{spring}} - mg \\F_{\text{spring}} &= m(a + g)\end{aligned}$$

Then use Hooke's Law

$$F_{\text{spring}} = kx$$

$$kx = m(a + g)$$

$$x = \frac{m(a + g)}{k} = \frac{(2.2 \text{ kg})(3.25 + 9.81 \text{ m/s}^2)}{(8.2 \text{ N/cm})} = 3.50 \text{ cm}$$

Answer: 3.50 cm.